Paraquat Dichloride

Esta web está disponible en español <https://espanol.epa.gov/seguridad-laboral-al-usar-pesticidas/dicloruro-de-paraquat>

Paraquat dichloride, commonly referred to as "paraquat," is one of the most widely used herbicides in the United States. Since paraquat's first registration, EPA has reviewed and reassessed its safety and uses, including undergoing registration review, a program that re-evaluates each registered pesticide on a 15-year cycle.

In July 2021, after receiving and considering public comments on the paraquat proposed interim decision, EPA released the interim decision for registration review. As part of this action, EPA is requiring mitigation measures to reduce risks associated with paraquat in order to protect human health and the environment.

- The interim decision for paraquat is now available in docket EPA-HQ-OPP-2011-0855 <https://www.regulations.gov/docket/epa-hq-opp-2011-0855> at www.regulations.gov <https://www.regulations.gov/>.

On this page:

- Basic information on uses
- Using paraquat dichloride products safely
- Human health

News

- Take the Paraquat Certified Applicator Training or view Paraquat training FAQs <https://epa.gov/pesticide-worker-safety/paraquat-dichloride-training-certified-applicators>
- EPA Takes Steps for New, Stronger Protection from Paraquat <https://epa.gov/pesticides/epa-finalizes-new-stronger-safety-measures-pesticide-paraquat>
- Read the EPA's Human Health Mitigation Decision for Paraquat

- Ecological health
- EPA actions
- Additional information

Basic Information on Uses

Paraquat dichloride, commonly referred to as “paraquat,” is one of the most widely used herbicides in the United States. Paraquat is also often referred to as Gramoxone (a popular end-use product). It is an important tool for the control of weeds in many agricultural and non-agricultural settings. It is also used for desiccation of crops, like cotton, prior to harvest.

There are no homeowner uses and no products registered for application in residential areas.

All paraquat products registered for use in the United States are Restricted Use Pesticides (RUPs) that may only be used by trained certified applicators.

Using Paraquat Dichloride Products Safely

If you, your child or anyone else comes in contact with paraquat, seek medical assistance immediately. Ingestion of paraquat can be fatal, and dermal or eye contact can have serious lasting effects.

To prevent severe injury and/or death from paraquat ingestion, all paraquat products must:

- Be used only by a certified applicator. Unlike most other restricted-use products, paraquat may not be used by persons working under the supervision of a certified applicator.
- Never be transferred to a food, drink or any other container. New packaging requirements will help to prevent this from occurring.

- Always be kept secured to prevent access by children and/or other unauthorized persons.
- Never be stored in or around residential dwellings.
- Never be used around home gardens, schools, recreational parks, golf courses or playgrounds.

To prevent severe injury and/or death from skin or eye exposure to paraquat:

- Follow label instructions.
- Use the required personal protective equipment specified on the product label.

Human Health

Paraquat is highly toxic. One small sip can be fatal and there is no antidote.

Illegally transferring paraquat to beverage containers and later mistaking it for a drink has resulted in the accidental ingestion of the pesticide and causes approximately 1-2 deaths per year. New packaging requirements and other risk mitigation measures required by EPA in 2016 and implemented between 2017 and 2020, are expected to minimize the illegal transfer of paraquat to beverage containers. Incidents also suggest that paraquat is corrosive to the skin and eyes.

In the 2019 draft human health risk assessment <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0121>, EPA found no dietary risks of concern associated with paraquat when it is used according to the label instructions. The draft risk assessment identified potential risks to workers who mix, load, and apply paraquat or enter treated fields after application. New worker exposure data generated by the Agricultural Handler Exposure Task Force became available after completion of the 2019 assessment and has been incorporated into an addendum <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0215>. The Agency also identified potential risks from spray drift to bystanders at the edge of the field. To address risks associated with paraquat use, EPA required restricted entry intervals (REIs) for crops, additional personal protective equipment (PPE) as well as other measures, which can be found below in the Registration Review section.

EPA evaluated hundreds of studies, including published toxicity and epidemiology literature on paraquat exposure and adverse health outcomes, including Parkinson's Disease. There are many studies on paraquat and Parkinson's Disease that range in quality and provide conflicting results. Following EPA's 2019 literature review <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0125>, an updated study <https://pubmed.ncbi.nlm.nih.gov/32919961/> of the Agricultural Health Study cohort was published in 2020 that reported no association between paraquat exposure and Parkinson's Disease. Notably, this updated study did not replicate earlier 2011 findings from AHS <https://www.ncbi.nlm.nih.gov/pmc/articles/pmc3114824/> that were considered by EPA and suggested a potential association may exist. After a thorough review of the best available science, as required under FIFRA, EPA has not found a clear link between paraquat exposure from labeled uses and adverse health outcomes such as Parkinson's disease and cancer.

After EPA's approval of updated labels for paraquat, in January 2024, Syngenta Crop Protection submitted a new paraquat vapor pressure study under Section 6(a)(2) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which requires pesticide registrants to submit any new information regarding unreasonable adverse effects to the agency. Vapor pressure is a key parameter influencing the extent to which pesticide surface residues may convert into gaseous vapors that could move through the air, which could potentially impact workers and bystanders who live or work near or adjacent to treated fields.

The new vapor pressure study indicated a higher vapor pressure value for paraquat than was previously used in EPA's risk assessments. EPA's review of the new study was completed in March 2024 and is available in the paraquat at reglations.gov in docket EPA-HQ-OPP-2011-0855-0326 <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0326>. Because the new data could change the extent of volatilization estimated in EPA's analysis, EPA initiated an additional review.

In November 2025, EPA released a memorandum <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0554> that incorporates the new vapor pressure study with previously existing data and information and presents EPA's conclusion that there is greater uncertainty regarding the potential for paraquat to volatilize than previously considered. To resolve the uncertainty around the volatilization potential of paraquat, EPA will issue a Data-Call In (DCI) notice to paraquat

manufacturers under the authority of FIFRA section 3(c)(2)(B). EPA follows the review and approval process through the Office of Management and Budget which is needed prior to release of the DCI. Once the data is received and reviewed by EPA, an updated analysis will be performed and published as part of the ongoing registration review process for paraquat along with any possible refinements of EPA's bystander inhalation exposures analysis.

Ecological Health

The 2019 draft ecological risk assessment <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0128> identified potential risk to mammals, birds, terrestrial invertebrates, terrestrial plants, and algae. To address these risks, EPA required spray drift management labeling to reduce off-target spray drift and protect non-target plants and wildlife.

EPA is committed to protecting pollinators from pesticide exposure. As with all other herbicides, EPA is requiring registrants to update the label language for these pesticides to raise awareness of their potential effects to pollinator habitat and direct users to instructions on minimizing spray drift.

EPA Actions

Actions to Prevent Accidental Ingestion and Reduce Exposure to Workers

In 2016, to minimize accidental paraquat ingestions and to reduce exposure to workers who mix, load and apply paraquat, EPA is requiring:

- Changes to the pesticide label and distribution of supplemental warning materials to highlight the toxicity and risks associated with paraquat products.
- Restricting the use of paraquat to certified pesticide applicators only. Individuals working under the supervision of a certified applicator are prohibited from using paraquat.

- Specialized training for certified applicators <https://npsec.us/paraquat> who use paraquat to emphasize that the chemical should not be transferred to or stored in improper containers.
- New closed-system packaging designed to prevent transfer or removal of the pesticide except directly into proper application equipment. This will prevent spills, mixing or pouring the pesticide into other containers or other actions that could lead to paraquat exposure.

These mitigation measures are described in detail, along with implementation information in the Registration Review Docket. View the 2016 Paraquat Dichloride Human Health Decision mitigation measures.

EPA distributed a safety message that highlights the toxicity of paraquat and illustrates the negative repercussions of misusing paraquat to pesticide application educators for use in training sessions. View EPA's paraquat safety message <https://epa.gov/pesticide-worker-safety/paraquat-dichloride-one-sip-can-kill>.

Registration Review

Paraquat was first registered in 1964 and completed reregistration in 1997. EPA initiated registration review for paraquat in 2011. In October 2019, EPA released the draft human health and ecological risk assessments for public comment.

Paraquat Draft Human Health Risk Assessment <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0121>

Paraquat Draft Ecological Risk Assessment <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0128>

In October 2020, EPA released the paraquat proposed interim decision <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0209> and addendum <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0215> to the paraquat draft human health risk assessment. After reviewing public comments on the proposed interim decision, EPA released the paraquat interim decision in July 2021. The interim decision for paraquat finalizes new, stronger protections to reduce exposure to paraquat. The enforceable mitigation measures include the following:

- Limit aerial applications to a maximum of 350 acres per applicator per 24-hr period for all uses except cotton desiccation;
- Require a residential area drift buffer for all aerial applications;
- Prohibit use of human flaggers;
- Prohibit pressurized handgun and backpack sprayer application methods;
- Limit the maximum application rate for alfalfa to one pound of paraquat cation per acre;
- Require enclosed cabs if area treated in 24-hour period is more than 80 acres;
- Require enclosed cabs or PF10 respirators if area treated in 24-hour period is 80 acres or less;
- Require a 7-day restricted entry interval (REI) for cotton desiccation;
- Require a 48-hour REI for all crops and uses except cotton desiccation; and
- Require mandatory spray drift management label language.

EPA uses interim decisions to finalize enforceable mitigation measures while conducting other longer-term assessments, such as an endangered species assessment.

- In addition, EPA is updating the Restricted Use Pesticide statement on paraquat labels to allow truck drivers who are not certified applicators to transport paraquat when certain conditions are met.
- Paraquat Interim Decision <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0307>
- Paraquat Proposed Interim Decision <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0209>
- Paraquat response to Proposed Interim Decision ecological <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0309> and human health <https://www.regulations.gov/document/epa-hq-opp-2011-0855-0310> comments

Paraquat Dichloride Information Resources

- Syngenta’s Paraquat Information Center <https://www.syngenta.com/en/protecting-crops/products-list/paraquat>
- Docket for paraquat <https://www.regulations.gov/docket/epa-hq-opp-2011-0855>: EPA-HQ-OPP-2011-0855 at www.regulations.gov <https://www.regulations.gov/>.

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